

ABSTRACT

A fuel reforming apparatus quickly heats the temperature of a catalyst to an activation temperature to shorten a startup time. The apparatus supplies a hydrocarbon fuel and an oxidizer upstream from a second catalyst (2), and steam upstream from a first catalyst (1). The second catalyst starts a rapid oxidation reaction to generate a high-temperature gas which heats the first catalyst. When the apparatus changes a startup operation or an accelerating operation to a steady operation after a predetermined period, the apparatus supplies the hydrocarbon fuel and steam upstream from the second catalyst, and the oxidizer upstream from the first catalyst. As a result, the second catalyst starts a steam reforming reaction to absorb heat from the second catalyst. And the second catalyst rapidly cools to stop reactions and pass the hydrocarbon fuel and steam without reactions. Then, a hydrogen-rich reformed gas is generated from the passed hydrocarbon fuel and steam.